**Template | Unit Enhancement**

***EXPLANATION & ARGUMENTATION***

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**Background Information**

**Instructional Materials Title: Sound**

**Publication Date:**

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**Date Developed: 8.23.2013**

**High Leverage Lesson (Title and Page Number): TUNING A STRINGED INSTRUMENT #11.5 Manual: pages 89-92 Instructional guide: pages 37-40 Note: CER is taught between Lesson #11 and Lesson #12**

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**Rationale**

· **Why we identified this particular lesson: This lesson provides an authentic opportunity for students to practice claim, evidence and reasoning in order for them to demonstrate their understanding of the relationship between length, pitch, and rate of vibrations.**

**- Connections to NGSS Practices and WA Science Standards:**

WA: 4-5PS3D

WA: 2-3INQB

WA: 2-3INQF

WA: 2-3INQG

NGSS: 3-PS2-2

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***Explanation* Lesson Enhancement**

**Overview**

· **Identification of where within the High Leverage Lesson to insert enhancement: Lessons 2, 3, 4 & 5 students will have opportunities to observe the relationship between length and pitch. Lessons 4, 5, 9 & 11 students will have opportunities to observe vibrations. Therefore, by lesson 11.5 students will be able to support a claim with evidence and reasoning.**

· **Key instructional strategies and tools needed: Tuning forks, rulers, meter sticks, nails, xylophone, string and cup, peg-board harp, etc.**

**Part 1: Lesson Modifications to Lead Up to *Explanation* Experience**

**Complete lesson 11 by following the manual and Instructional Guide. The CER will be following lesson 11 (“11.5”).**

**Part 2: *Explanation* Learning Sequence**

This lesson is a culmination of a series of lessons in which students build an understanding of the relationship between length and pitch and vibration.

The beginning of lesson 11.5 there will be a demonstration of different lengths to observe vibrations that will lead to a discussion about the rate of vibrations in relationship to length.

Review with demonstrations:

Different lengths of the meter stick (watching for the rate of vibrations)

Short: how many times is it moving up and down?

Long: how many times is it moving up and down? (Moves up and down at a slower rate than the shorter meter stick.)

*Turn and talk:* Why do you think that is happening? (Ideas: The short meter stick moves up and down at a faster rate because there is less of it to move up and down. The long meter stick moves up and down at a slower rate because there is more of it to move up and down.)

*Class discussion:*

What do you notice about the pitch when it is moving up and down slower, or vibrating at a slower rate?

What do you notice about the pitch when it is moving up and down faster, or vibrating at a faster rate?

What happens to the pitch when the rate of vibration changes?

In partners, students work with harps and a bridge to look at the length, pitch, and vibrations.

Students will practice stating a one-sentence claim with partners. Students practice using quantitative data as part of their evidence, when possible (rulers).

**Part 3-A: Describe Assessment Task**

*Include the* ***question****,* ***evidence*** *students will use, and* ***scientific concepts*** *students will use in their reasoning.*

Question: What is the effect of length on pitch? (Prompt: Write a one-sentence claim explaining how length affects pitch.)

Data: Different lengths of tuning forks, nails, rulers, meter sticks, xylophone bars, and harps and the different pitches produced. Students should use qualitative (long and short) and quantitative (measurement of ruler length) data to describe length.

Possible claims:

Big things make a low sound little things make a loud sound. (incorrect/naïve claim)

Length affects pitch. (average claim)

The affect of length on pitch is that long objects produce low pitches and short objects produce high pitches. (strong claim)

Evidence:

Prompt: Provide evidence to support your claim. The evidence should include qualitative and quantitative data from at least three investigations.

Reasoning:

Prompt: Explain why your evidence supports your claim. Define pitch and include the relationship between the length, pitch, and the rate of vibrations.

*Pitch is how high or low something sounds and this happens because different lengths vibrate at different rates. For example, if an object is long the pitch is low and it vibrates at a slow rate. The slower the rate the lower the pitch.*

**Part 3-B: Assessment Rubric**

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**Additional Information**

NOTES

· Information that will be useful when teaching this lesson

- Resources that will be useful: sound kit, possible addition of a metal meter stick

- Scaffolds that students will use

Notes about unburdening unit: